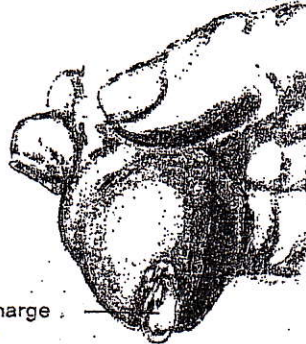


CLINICAL MICROBIOLOGY



Diplococcus



Urethral discharge

GONOCOCCI

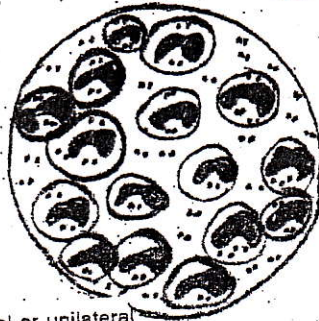
In Women

Pelvic Inflammatory Disease

Fever

Bilateral or unilateral lower-quadrant pain

Vaginal discharge



Infectious discharge in birth canal may lead to gonococcal conjunctivitis in newborn

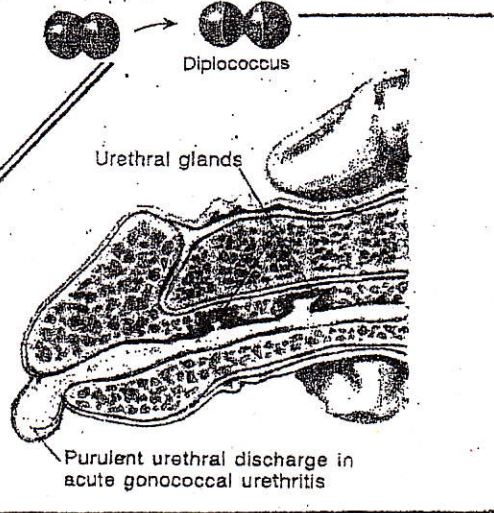
ophthalmia neonatorum.

if untreated he will be blind.

Diplococcus

Urethral glands

Purulent urethral discharge in acute gonococcal urethritis



DR. A. PROF. NABEEL AHMED BIN AHMED.

erythromycin ointment or silver nitrate

prophylaxis for

All neonates

13.2.15.

مركز الشامل للخدمات الطلابية

5 minutes result
pus

too large number of pus cells

GENUS : NEISSERIA.

A. MORPHOLOGY AND IDENTIFICATION :-

1. Gram negative diplococci.
2. Intracellular organisms.
3. Non motile, non sporeforming.
4. Aerobic - capnophiles i.e. need 5-10% CO₂.
5. Oxidase positive. all neisseria.



Candle jar
Neisseria & streptococcus
H. Influenza

6. Pathogenic neisseria grow in blood agar, and best in chocolate - agar + 5-10% CO₂ + moisture + strict 37°C - 37°C.

7. Non pathogenic neisseria grow in blood agar, chocolate agar, as well as in plain agar.

B. ANTIGENIC STRUCTURE :-

1. Capsulated meningococci. N. meningitidis
2. Non capsulated = gonococci.
3. Pili :-

- Capsulated meningococci
- Non capsulated gonococci

- Contain pillin (peptide subunits).
- Organs of attachment to epithelial cells and mucosal cell surfaces.
- Confer resistance to phagocytosis, therefore are virulence factor.
- Highly antigenic 20 gonococcal genes code for pillin.
- By recombining chromosomal regions of these genes, a single strain of Neisseria gonorrhoeae can at different times synthesize multiple pilins that have

No phagocytosis
Virulence factor

20 genes code for pillin

Protein of Pili

Key terms :-

Capnophilic

Fitz-Hugh-Curtis syndrome

Gonorrhea

ophthalmia neonatorum

pelvic inflammatory disease

Penicillinase producing N. G.

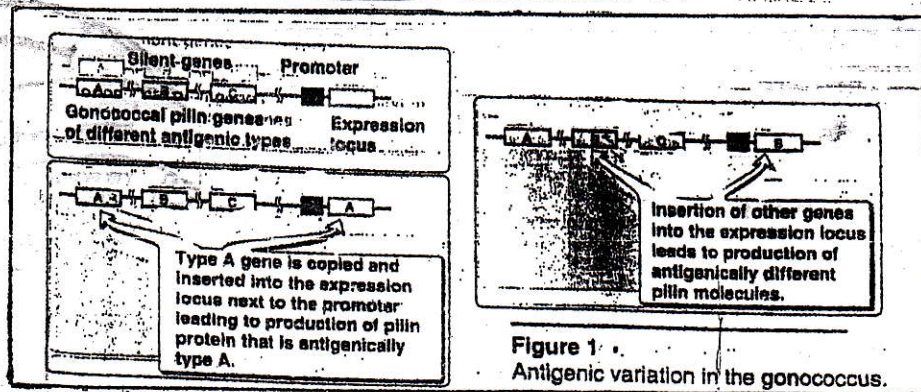
waterhouse-Friedrichsen

syndrome

- ✶ The Pili of Almost all strains of *N. gonorrhoea* are antigenically variable (different) and a single strain can make many antigenically distinct forms of Pili.

- ✶ **Porin**: a channel-forming protein in cell membranes that facilitate the diffusion of water and small molecules in and out of the cell.

different amino acid sequences giving rise to more than 100 serotypes. This process is known as GENE CONVERSION, fig(1), OR PROGRAMMED - REARRANGEMENT.



- **GENE CONVERSION** makes the gonococci avoid our immune system and thereby cause repeated infections in the same individual. *reinfection*

4. I.O.S.: (Lipooligosaccharide) stimulates L.M. & inhibits E.C.

4. **L.O.S.:** (Lipooligosaccharide): stimulates IgM- antibodies.
Toxicity is due to the endotoxic effect of LOS in fallotriantubes
5. **O.M.P.S:** (outer membrane proteins)

5. **O.M.P.S** : (outer membrane proteins)
- OMPI : functions as a porin in complex with OMPII.

- OMPII : opacity protein : makes the colonies less translucent. + binding to epithelial cells

- With pilli, it mediates attachment.
- Undergoes great antigenic variations, therefore it evades our immune system.

6. no toxins , no enzymes .

antibodies that block serum bactericidal-activity against pathogenic *Neisseria*.

Pathogenic - Neisseria 2 (Meningo And Gonococci):
 Binding - Host - cell - transferrin is specific -
 bacterial - surface receptors, thus getting their
 iron source.

C. CLASSIFICATION :-

1. Pyogenic cocci :-

- Meningococci : (*Neisseria meningitidis*)
- Gonococci. (*Neisseria gonorrhoeae*)

Meningococcal meningitis

Saprophyte:
any organism living on
decaying or dead organic
matter. most of the fungi
and bacteria are
saprophytes.

2. Commensal cocci AND SAPROPHYTES :-

- Neisseria*... *Nicca* = *Nasopharynx*.
 - Neisseria*... *subflava* = *Nasopharynx*.
 - Neisseria*... *animalis*.
 - Neisseria*... *canis*.
 - Neisseria*... *caviae*.
 - Neisseria*... *gigantea*.
 - Neisseria*... *lactamica*.
- Nonpathogenic
- COMMENSALS.
- IN ANIMALS AND
IN NATURE.
(SAPROPHYTES.)

3. Opportunistic cocci:-

- Neisseria*... *flavescens* = *Nasopharynx*. Can cause Meningi-
- Neisseria*... *mucosa* =
- Neisseria*... *catarrhalis*, now it is called :-

AIDS Patient

Branhamella catarrhalis: Found in
Nasopharynx; CAN CAUSE Urethritis,
Bronchitis, Pneumonia AND Meningitis.

Grow in
Anaerobic Jar
Arose
Mecridash
Jar.

Veillonella: GRAM-NEGATIVE COCCI IN MASSES
OR AS DIPLOCOCCI, STRICT ANAEROBIC, FOUND IN THE
INTESTINAL-TRACT, VAGINA, MOUTH AND U.R.T. AND FOUND IN

D. PATHOGENESIS AND CLINICAL PICTURE:-

- Name of the disease: GONORRHEA.
- Causative organism: *Neisseria gonorrhoeae* (gonococci).
- MODE OF TRANSMISSION :

- Sexual intercourse .

Common



*Imp

Gras Bag

Alumina Pellets coated Pallid³

anaerobic indicator → Blue → anaerobic if white
no anaerobic
2 gram - diplococci.

2 modes of infection:
1- Delivery
2- sexual transmission
New to men

Pure Human Pathogens
1- chlamydia
2- syphilis
3- gonorrhea

b. During delivery from infected mother, newborns can get the gonococci into their eyes. *ophthalmia neonatorum*

4. ESTABLISHMENT OF THE DISEASE :-

Pili and OMP-II facilitate adhesion of the gonococci to epithelial cells of the ⁽¹⁾urethra, ⁽²⁾rectum, ⁽³⁾cervix, ⁽⁴⁾pharynx or ⁽⁵⁾conjunctiva. Pili and OMP-II resist phagocytosis. Gonococci IgA protease cleaves IgA, thus helping the gonococci to evade immunoglobulins of this subclass.

IgA Protease

newborn

Pus Production

Localized infection with pus production occurs, or may lead to tissue invasion, chronic inflammation, and fibrosis. Males are symptomatic in contrast to the asymptomatic females, who act as **RESERVOIRS**. → females

females are asymptomatic

Note:- more than one sexually transmitted disease, can be acquired at same time :- think of these if gonorrhea.

- ❖ Gonorrhea.
- ❖ Syphilis. *Treponema Pallidum*
- ❖ Trichomoniasis. *Trichomonas vaginalis*
- ❖ N.S.U. (Chlamydia trachomatis) *Non specific urethritis*
- ❖ HIV (AIDS).
- ❖ HBV infection.

5. GENITOURINARY TRACT INFECTIONS:-

GONORRHEA IN MALES :- man complains of yellowish, thick purulent urethral discharge, frequency of micturation, with severe painful micturation, (dysuria).

The commonest complications are ⁽¹⁾epididymitis, ⁽²⁾septicemia, ⁽³⁾urethral stricture and ⁽⁴⁾prostatitis. Infection may spread to perirethral-tissue causing multiple discharging sinuses (Watercan - perineum) in Males only

Water can Perineum

with too large mbs & cells even gram negative
too large mbs & cells gram negative
pus cells mbs & cells gram negative
discharge in urethra

4

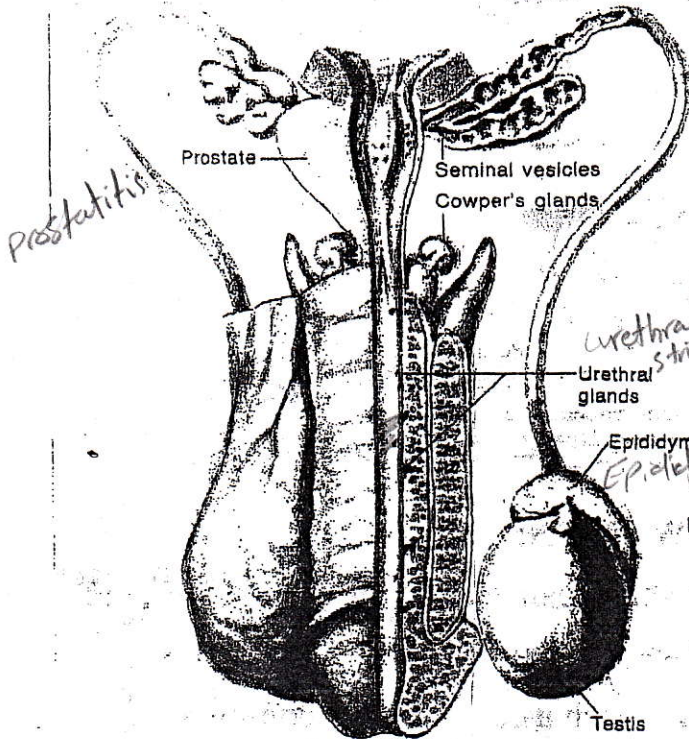
erythro
Chlamydia trachomatis - by Pigeons
Cryptococcus
group of urethritis now
Trachoma
Pneumonia
Birds or Poultry
ST D - urethritis non specific

Common Complications of Gonorrhea

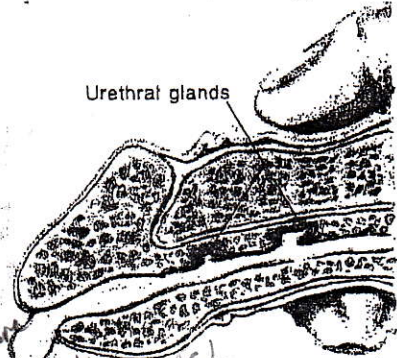
- ① Prostatitis
- ② urethral stricture
- ③ Epididymitis
- ④ watercan Perineum
- ⑤ septicemia.



Gonorrhea in the Male

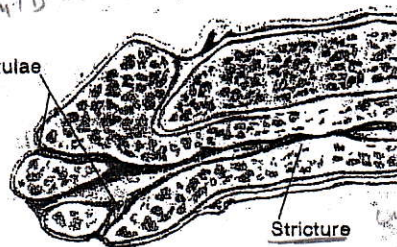


Urethral glands, Cowper's glands, prostate, seminal vesicles, or testes may be affected



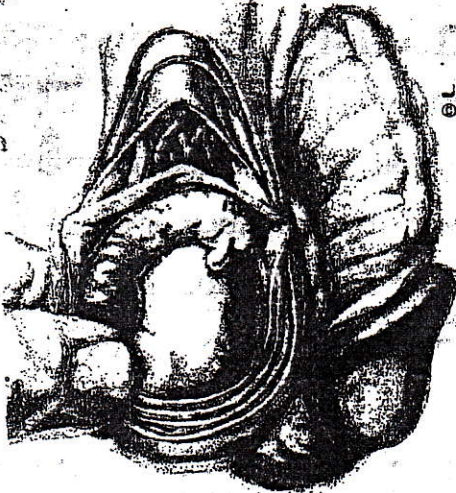
Purulent urethral discharge in acute gonococcal urethritis

yellow thick purulent

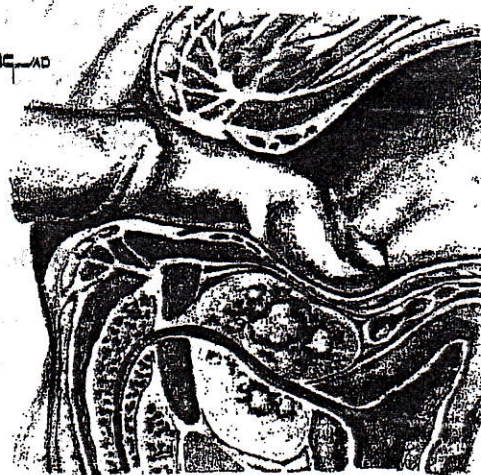


Urethral strictures and fistulae may result from severe gonorrhea

urethral stricture



Acute gonococcal epididymitis



Gonococcal prostatitis, rare in antibiotic era

Bilateral epididymitis may lead to permanent sterility in man,
fig(2).

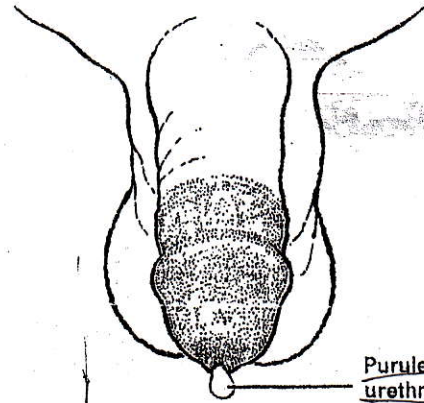


Fig 2.2 Gonorrhoea in the male

(GONOCOCCAL - urethritis).

GONORRHEA IN WOMEN:-

Endocervicitis occurs, which can extend to the urethra.

vagina is spared because of vaginal - acidic - pH.

Green, yellow, cervical discharge is most common with intermenstrual bleeding.

Complication is PELVIC INFLAMMATORY DISEASE (PID). This is a collective term for, any extensive gonococcal or other bacterial infection (chlamydial) of the female pelvic organs, particularly the uterus, cervix, uterine tubes or ovaries.

When gonococci are attached to the spermatozoa and carried from the cervical region to the uterine tubes, SALPINGITIS occur.

Salpingitis is the infection of the uterine tubes, and is considered to be the most serious form of P.I.D., leading to scarring of ovaries and uterine tubes resulting to FEMALE STERILITY and ECTOPIC PREGNANCIES, fig (3).

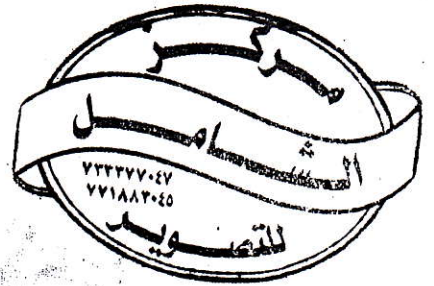
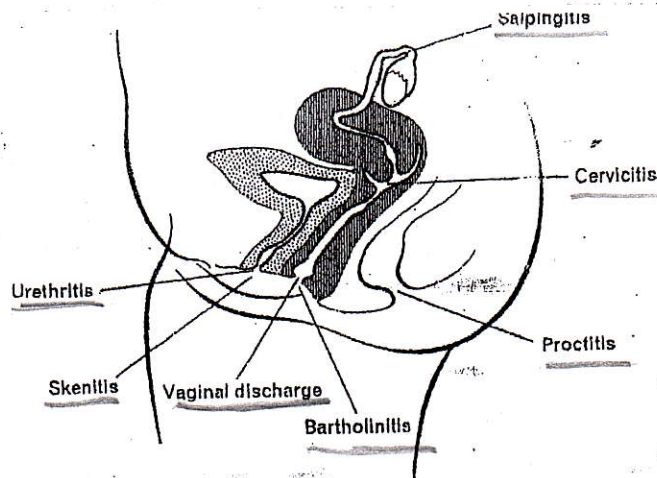


Fig 2.4 Gonorrhoea in women

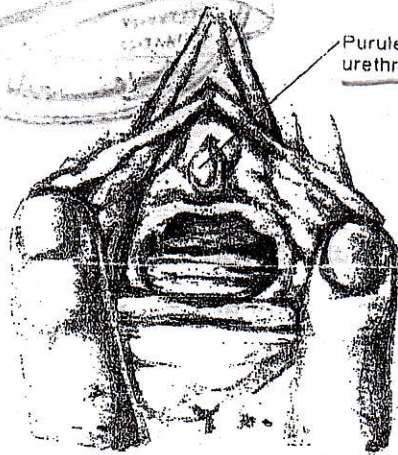
6. ⇒ **RECTAL INFECTIONS**, prevalent in male homosexuals, are characterized by constipation, painful defecation, and purulent discharge.

7. ⇒ **PHARYNGITIS** is contracted by oral-genital contact. Infected individual also may show a purulent exudate, and the condition may mimic a mild viral or a streptococcal sore throat.

8. ⇒ **OPHTHALMIA NEONATORUM** is an infection of the conjunctival sac that is acquired by a newborn during passage through the birth canal of a mother infected with gonococcus. If untreated, acute conjunctivitis may lead to **BLINDNESS**. For many years, routine prevention was performed immediately after birth by the instillation of a dilute solution of silver nitrate into the eye. Today clinicians prefer the use of erythromycin in place of silver nitrate, because the antibiotic also eradicates Chlamydia trachomatis, if present. (Note : gonococcal conjunctivitis can also occur in adults, gonococcal - pus to the eyes by fingers)

9. ⇒ **DISSEMINATED INFECTION** : most strains of gonococci have a limited ability to multiply in the bloodstream.

Gonorrhea in the Female

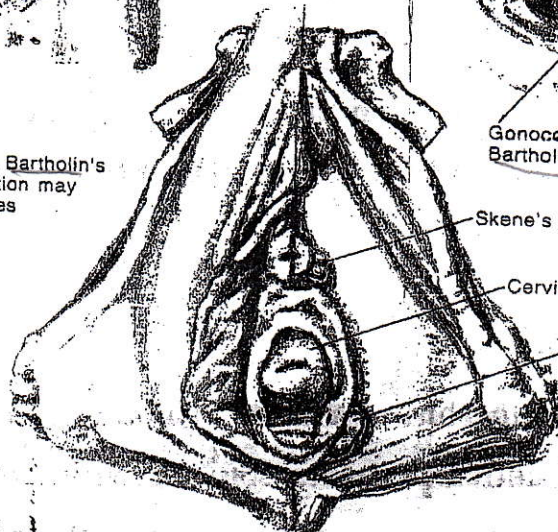


Purulent discharge of urethritis

Involvement of urethra, Bartholin's glands, or cervix. Infection may ascend to fallopian tubes and pelvic peritoneum



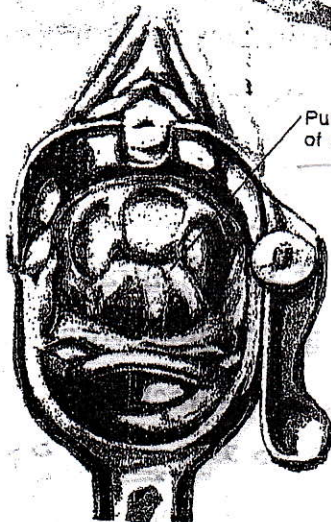
Gonococcal abscess of Bartholin's gland



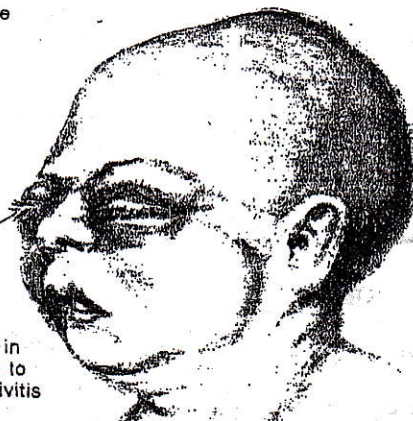
Skene's glands

Cervix

Bartholin's gland

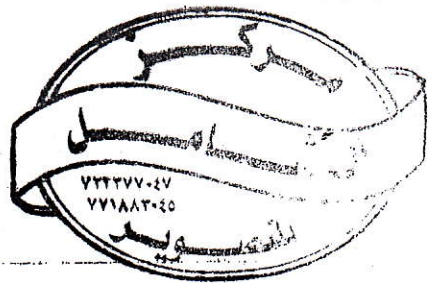


Purulent cervical discharge of acute gonorrhea

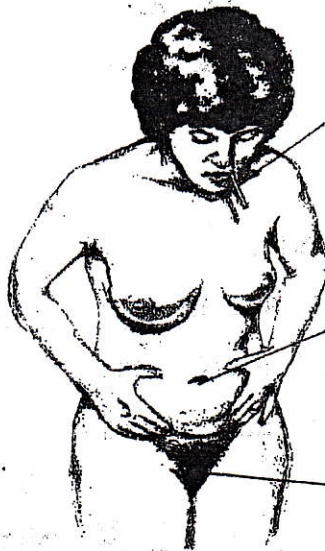


Infectious discharge in birth canal may lead to gonococcal conjunctivitis in newborn

JOHNA. CRAIG, M.D.
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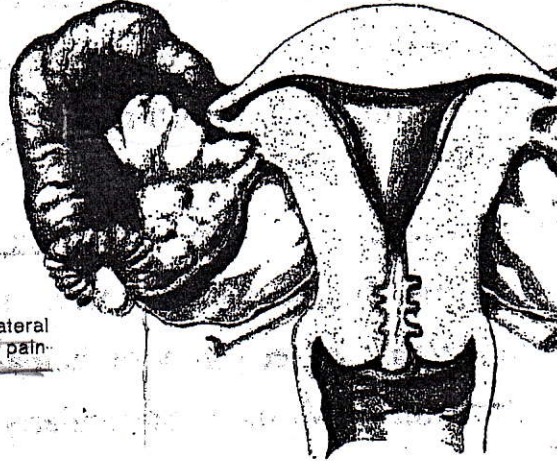
Pelvic Inflammatory Disease



Fever

Bilateral or unilateral lower-quadrant pain

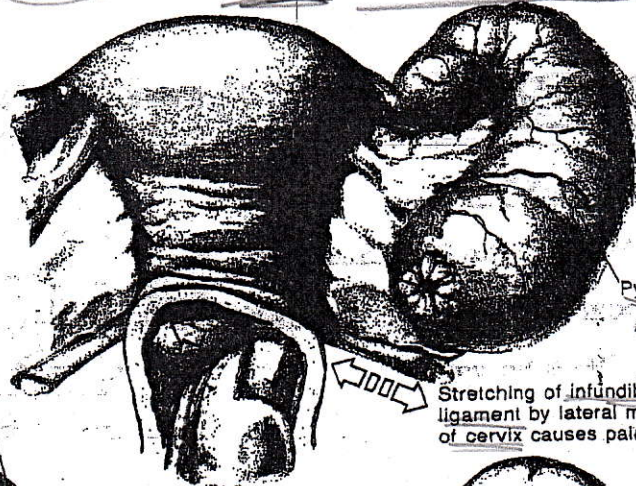
Vaginal discharge



Acute salpingitis develops from ascending infection (eg, cervicitis) and drains to involve peritoneum

Swelling of tubes causes fullness and tenderness on palpation of adnexa

ملفحة

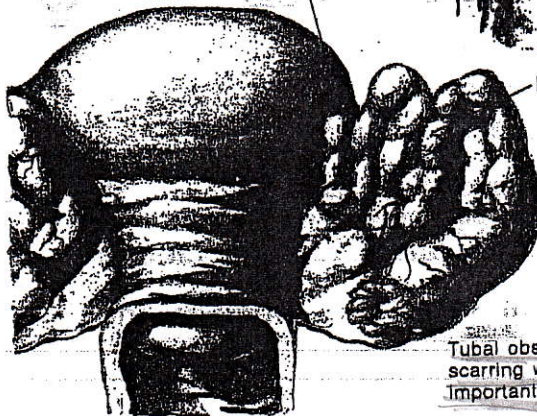


Pyosalpinx

JOHN A. CRAIG, MD
© CIBA

Isthmic stenosis

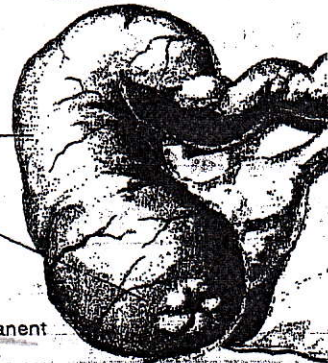
Stretching of infundibulopelvic ligament by lateral movement of cervix causes pain



Kinking

Chronic hydrosalpinx

Clubbing



Tubal obstruction and permanent scarring with infertility, most important local complication

Bacteremia with Gonococci is rare.

Therefore, bacteremia with gonococci is rare. (note: in contrast, meningococci multiply rapidly in blood, however, some stains do invade the blood stream and may result in a disseminated infection in which the organisms can cause ① fever, ② erythematous or maculopapular lesions on the skin, and a painful, ③ purulent arthritis).

(Note: gonococcal infection is the most common cause of septic arthritis in sexually active adults). Disseminated infections are seen in both men and women, but are more common in women, particularly during pregnancy and menses.

E . LABORATORY DIAGNOSIS :-

• SPECIMENS :-

1. Urethral discharge SWAB.

2. Cervical discharge SWAB.

3. Eye (PUS) swab .

4. Blood .

5. Rectal swab.

6. Throat swab.

7. Vaginal swab. _____

IN THE LABORATORY
- VAGINAL - ROOM, IN
A GYNECOLOGICAL -
CHAIR + STRONG -
LIGHT.

8- Prostatic fluid in prostatic massage

• MICROSCOPY : Gram stain is done for the above mentioned specimens and we can see microscopically the following pictures:

Prostatic fluid
after prostatic
massage.

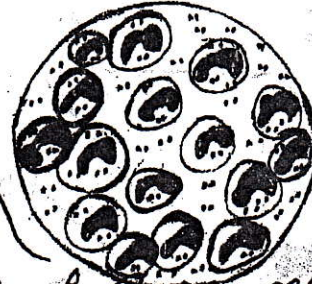
LABORATORY - DIAGNOSIS OF - GONORRHOEA:

(MICROSCOPICAL -
PICTURE OF THE
GRAM - STAINED
URETHRAL - DISCHARGE.

ACUTE - INFECTION:

- HEAVY - PURULENT -
URETHRAL -
DISCHARGE.

100 - Large - numbers of pus - cells, WITH
100 - Large - numbers of Gram - negative -
DIPLOCOCCI seen INTRACELLULARLY
AS - WELL - AS EXTRACELLULARLY.



OR: EYE -
SWABS
FROM -
NEW-BORN -
INFANTS
OR CERVICAL -
SWABS.

- Vaginal swabs are recommended for women who have had a hysterectomy and for prepuberal girls with gonococcal vulvovaginitis. Urine specimens for routine and microscopical examination of the sediment after centrifugation show large numbers of pus cells and large numbers of red blood cells.

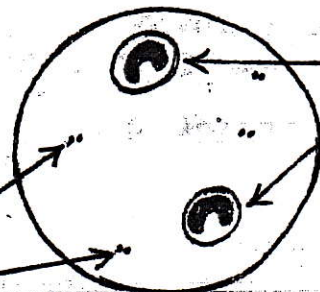
MICROSCOPICAL -
PICTURE OF
GRAM - STAINED -
SCANTY - URETHRAL -
DISCHARGE.

CHRONIC - INFECTION -
OF GONORRHOEA.

SCANTY - NUMBERS

OF GRAM - NEGATIVE - DIPLOCOCCI SEEN - EXTRA -
CELLULARLY.

SCANTY -
NUMBERS OF PUS - CELLS.

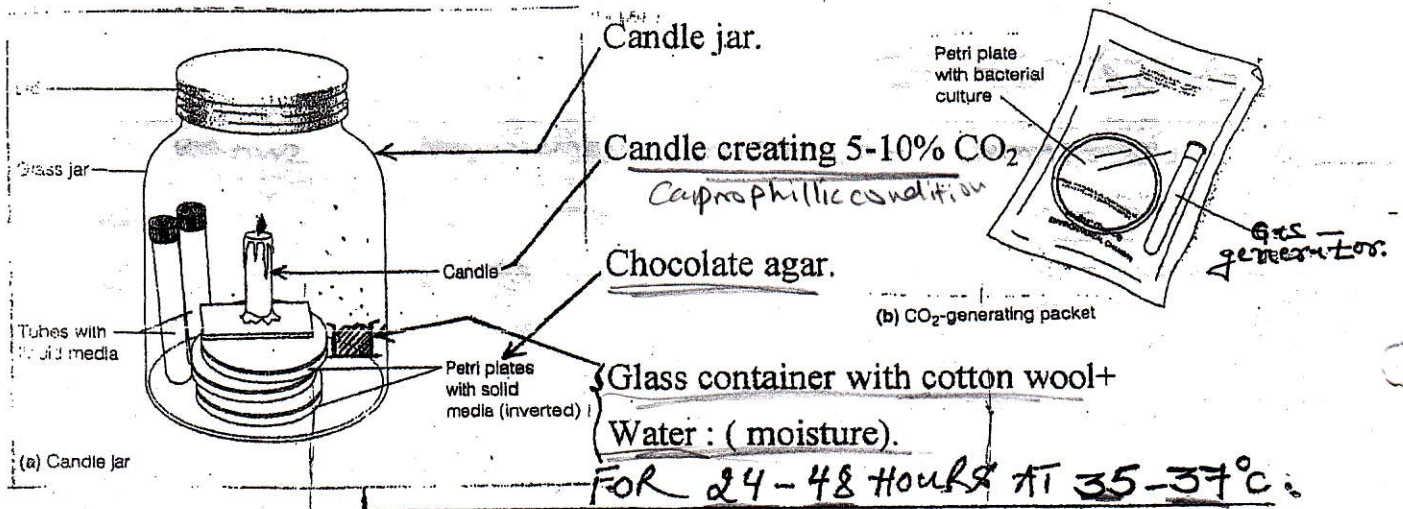


Full gram stain.

Scanty → chronic infection
No of Gonococci → Extracellularly

Rickettsia and chlamydia can not be stained by ordinary staining the same between viruses and bacteria.

CULTURE :-



F. EPIDEMIOLOGY, PREVENTION AND CONTROL:-

SOURCE :

1. Females, CARRIERS.
2. Patients. (♂ and ♀).
3. Infected pregnant women.

• Detect and treat, AND TRACE.

TRANSMISSION :

1. Sexual intercourse.
2. During delivery.
3. FINGERS TO EYES.

• Avoid
• Silver nitrate - 1% EYE-DROPS.
OR 0.5% erythromycin - eye ointment.
Propylhexes.

SUSCEPTIBLES :

1. Soldiers.
2. Tourists.
3. Non religious people.
4. Newborns.

• AVOID.

• S/N EYE DROPS
(Silver-Nitrate-EYE-DROPS)

writing about PPN G
and MRSA?



G. TREATMENT:

penicillins
Producing Neisseria
gonorrhoea

a. P.P.N.G strains emerged since 1975 in south east Asia.

b. Do sensitivity test.

c. Ciprofloxacin, and Ceftriaxone are the drugs of choice.

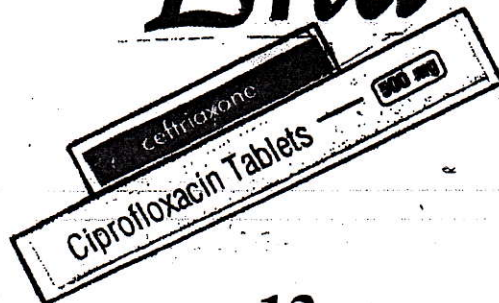
d. 0.5% ERYTHROMYCIN-EYE- OINTMENT.

e. TETRACYCLINE SHOULD BE PRESCRIBED
Also FOR C. trachomatis.

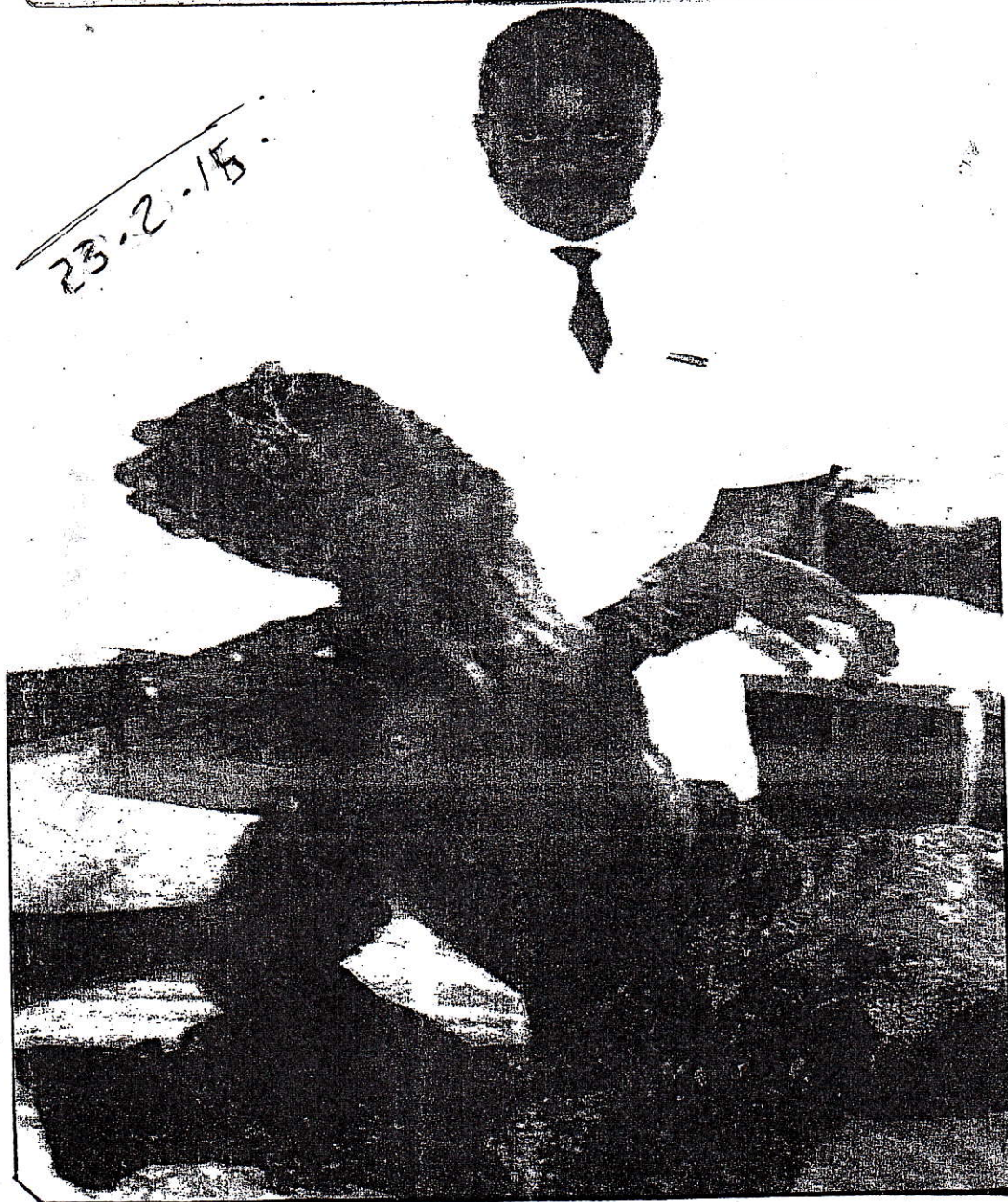
f. Follow-up culture for clearance,
should be done one week
after completion of treatment
to determine whether gonococci
are still present.

g. TRACING OF CASES.

End.



GRAM - NEGATIVE COCCI .
GENUS: NEISSERIA .
MENINGOCOCCI.



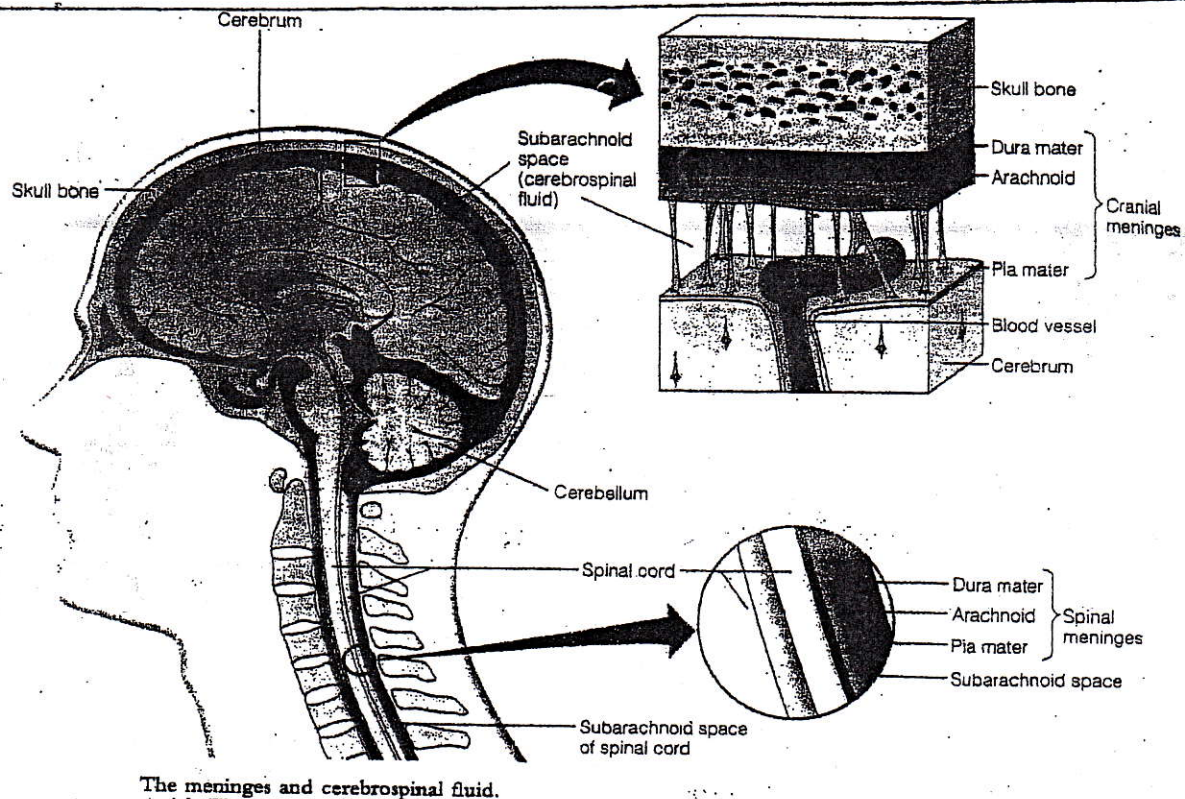
DR. A. PROF. NABEEL AHMED BIN AHMED .

23-2-15.

GRAM - NEGATIVE COCCI

GENUS: NEISSERIA

MENINGOCOCCI



- 1/. Meningitis is an inflammation of the meninges the membranes that cover the brain and the spinal cord.
- 2/. ENCEPHALITIS is the inflammation of the BRAIN.

DR. A. PROF. NABEEL AHMED BIN AHMED

مركز الشامل للخدمات الطلابية

modes of transmission

measles
newspaper

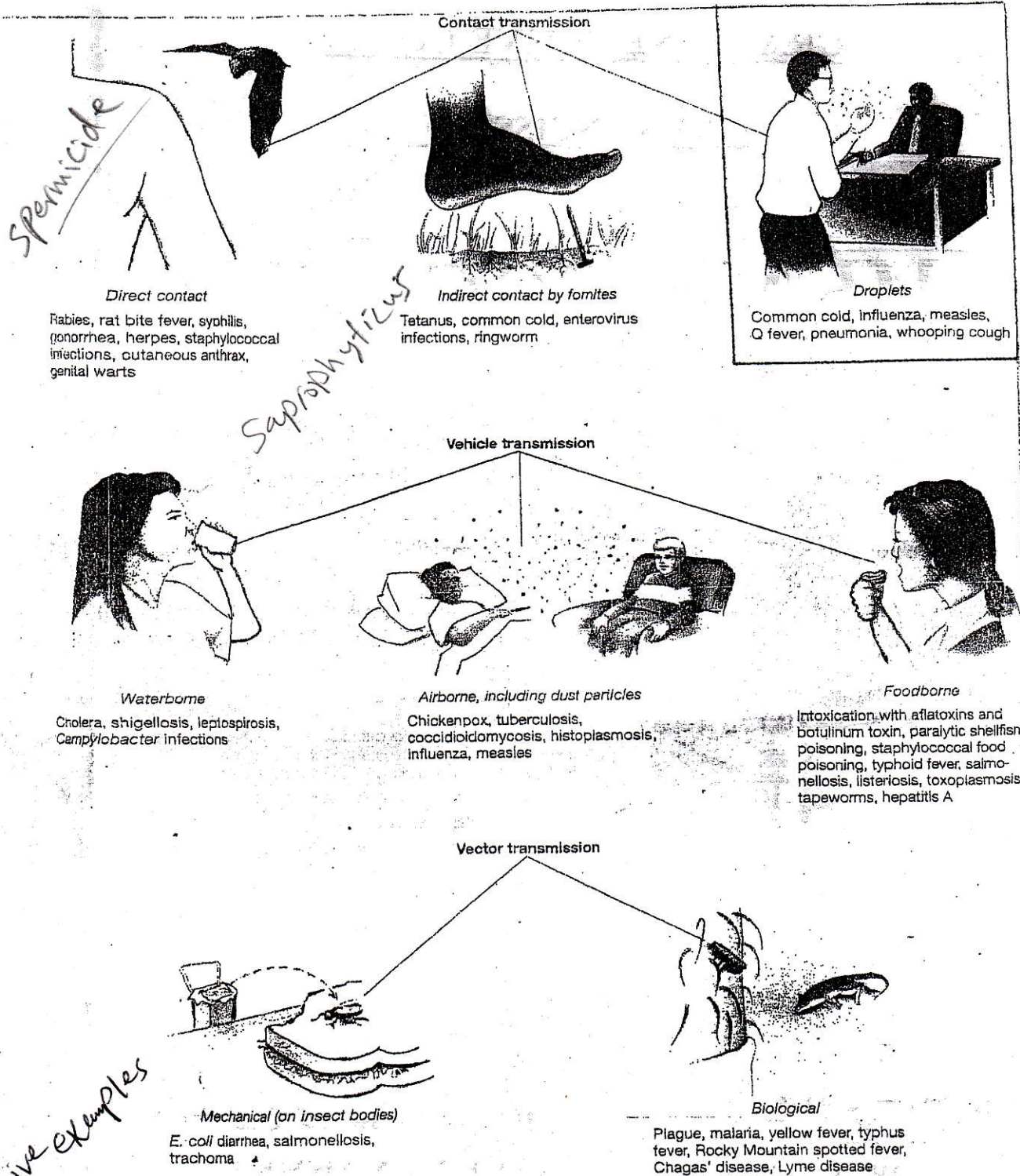


FIGURE 15.11 Modes of disease transmissions.



Figure 14.7 Droplet transmission. This high-speed photograph shows the spray of small droplets that come from the mouth during a sneeze.

A sneeze can blow air
out at 100 to 200 miles
per hour, release over
15,000 viruses per
sneeze.

مركز الشامل للخدمات الطلابية

GRAM - NEGATIVE COCCI

NEISSERIA

Meningitis
Meningococemia

Diseases: The genus *Neisseria* contains two important human Pathogens: *Neisseria meningitidis* and *Neisseria gonorrhoeae*. *N. meningitidis* mainly causes meningitis and meningococemia. *N. gonorrhoeae* causes gonorrhea, the second most common notifiable bacterial disease in the United States (table 16-1). It also causes neonatal conjunctivitis (ophthalmia neonatorum) and pelvic inflammatory disease (PID).

Important properties *Neisseriae* are gram - negative cocci that resemble paired kidney beans.

① Concave side face each other

(1) *N. meningitidis* (*meningococcus*) has a prominent polysaccharide capsule that enhances virulence by its antiphagocytic action and induces protective antibodies. Meningococci are divided into at least 13 serologic groups on the basis of the antigenicity of their capsular polysaccharides (table 16-2).

13 serotypes
based on
capsular
antigenicity

(2) *N. Gonorrhoeae* (*gonococcus*) has no polysaccharide capsule but has multiple serotypes based on the antigenicity of its pilus protein. There is **marked antigenic variation** in the gonococcal pili as a result of chromosomal rearrangement. more than 100 serotypes are known. Gonococci have three outer membrane proteins (proteins I, II, and III). Protein II plays a role in attachment of the organism to cells and varies antigenically as well.

Gene conversion

S. Sappor

UTT

up to now susceptible to penicillin

4

Specimen

Pinan

Prostatic fluid after urethral discharge → gonorrhoeae.

oxidase + Microg

Endotoxin of N. meningitidis is a LPS but N. gonorrhoeae has LOS

Phenylenediamine

مرکز الشامل للخدمات الطلابية

Neisseriae are gram - negative bacteria and contain endotoxin in their outer membrane. The endotoxin of N meningitidis is a lipopolysaccharide (LPS) similar to that found in many gram - negative rods, but the endotoxin of N gonorrhoeae is a lipooligosaccharide (LOS). Both LPS and LOS contain lipid A, but LOS lacks the long repeating sugar side chains of LPS. D-side chains

The growth of both organisms is inhibited by toxic trace metals and fatty acids found in certain culture media, eg, blood agar plates. They are therefore cultured on "chocolate" agar containing blood heated to 80 °C, which inactivates the inhibitors. Neisseriae are oxidase - positive; ie, they possess the enzyme cytochrome C. This is an important laboratory diagnostic test in which colonies exposed to phenylenediamine turn black as a result of oxidation of the reagent by the enzyme.

The genus Neisseria is one of several in the family Neisseriaceae. A separate genus contains the organism Moraxella catarrhalis. Which is part of the normal throat flora but can cause such respiratory tract infections as sinusitis, otitis, media, bronchitis and pneumonia. M catarrhalis and members of other genera, such as Branhamella, Kingella, and Acinetobacter, are described in Chapter 27. (M catarrhalis is the new name for Branhamella catarrhalis).

1. Neisseria Meningitidis

IMMUNITY Aids Epidemiology: Humans are only natural hosts for meningococci. The organisms are transmitted by airborne droplets; they colonize the membranes of the nasopharynx and become part of the transient flora of the upper respiratory tract. Carriers are usually asymptomatic.

TABLE -1. NEISSERIAE OF MEDICAL IMPORTANCE

Species	Portal Of Entry	Polysaccharide Capsule	Maltose Fermentation	β- Lactamase Production	Available Vaccine
N Meningitidis (Meningococcus)	Respiratory tract	+	+	NONE	(+)
N Gonorrhoeae (Gonococcus)	Genital tract	-	-	MOST	-

all Neisseriae Are Oxidase + Positive.

ABOUT 5% OF PEOPLE BECOME CHRONIC CARRIERS AND SERVE AS SOURCE OF INFECTION FOR OTHERS.

CARRIER-STATE CAN BECOME AS HIGH AS 35% AMONG PEOPLE IN CLOSE-QUARTERS, eg., MILITARY-CAMPS, AMONG PILGRIMS IN MECCA SCHOOLS, IN CINEMAS etc.

3-ORGANISMS CAUSE MORE THAN 80% OF CASES OF BACTERIAL-MENINGITIS IN PERSONS OVER 2 MONTHS OF AGE: 1/. *Streptococcus pneumoniae*, 2/. *Neisseria meningitidis* and 3/. *Haemophilus influenzae*.

THE MOST COMMON CAUSE OF BACTERIAL-MENINGITIS BETWEEN THE AGES 2-YEARS AND 18-YEARS IS *Neisseria meningitidis*.

ACCORDING TO THE L.P.S - CAPSULE OF *Neisseria meningitidis* THERE ARE 13-SEROLOGICAL-GROUPS. THESE SEROGROUPS ARE: - A, B, C, D, X, Y, Z, W135, 29E, H, I, K, and L.

MOST INFECTIONS ARE CAUSED BY SEROGROUPS: A, B, C, W135 AND Y, (SANITARY-EPIDEMIOLOGICAL-IMPORTANCE AND VACCINATION-CAMPAIGNS).

RESISTANCY TO THE DISEASE DEVELOPS WITH THE PRESENCE OF ANTIBODY TO THE CAPSULAR-POLYSACCHARIDE. MOST CARRIERS DEVELOP PROTECTIVE ANTIBODY TITRE WITHIN 2 WEEKS OF COLONIZATION.

IMMUNITY IS GROUP-SPECIFIC. COMPLEMENT IS ANOTHER-FEATURE OF HOST-DEFENCE-MECHANISM. VACCINES ALSO GIVE GOOD PROTECTION.

Table 16-2. Properties of the polysaccharide capsule of the meningococcus.¹

- | |
|--|
| (1) Enhances virulence by its antiphagocytic action. |
| (2) Is the antigen that defines the serologic groups. |
| (3) Is the antigen detected in the spinal fluid of patients with meningitis. |
| (4) Is the antigen in the vaccine. |

¹ The same four features apply to the capsule of the pneumococcus and *Haemophilus influenzae*.

TYPES
A, B, C, W135, Y
Cause Human
Disease

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Meningococci have three important virulence factors: -

- (1) a **polysaccharide capsule** that enables the organism to resist phagocytosis by polymorphonuclear leukocytes (PMNs);
- (2) **endotoxin (LPS)**, which causes fever, shock, and other pathophysiologic changes (in purified form, endotoxin can reproduce many of the clinical manifestations of meningococcemia); and
- (3) an immunoglobulin A (**IgA**) **protease**, which, by cleaving secretory IgA, helps the bacteria to attach to the membranes of the upper respiratory tract.

MOST FREQUENT - BACTERIA CAUSING BACTERIAL - MENINGITIS ACCORDING TO AGE - DISTRIBUTION :-

AGE	MOST FREQUENT CAUSATIVE AGENTS	COMMENTS
Newborn (0-2 months)	Escherichia coli, other <u>Enterobacteriaceae</u> , streptococcus speices	Average mortality about 50% incidence 40-50/100.000 live births; maternal transmission.
Preschool (2 months-5 years)	Haemophilus influenzae, type b; <u>Neisseria meningitidis</u>	Maximum incidence 6-8 months ; overall incidence 180/100.000 children
Youth and young adult (5-10 years)	<u>Neisseria meningitidis</u> , streptococcus pneumoniae	Sporadic or epidemic
Mature adult (over 40 years)	<u>Streptococcus pneumoniae</u> , staphylococcus speices	Sporadic خراي
Old people	<u>Listeria monocytogenes</u>	Sporadic
Pregnant women		
Fetus		
Newborns		
Immunocompromised persons		

There are vaccines for serogroups A C Y W135

Water-House-Friedrichsen
Syndrome
the
severe
form
of meningococemia

Neisseria meningitides .

Pathogenesis, pathology and Clinical - Findings .

Humans are the only natural hosts for whom meningococci are pathogenic .

The nasopharynx is the portal entry. There the organisms attach to epithelial - cells with the aid of pili , they may form part of the transient flora without producing symptoms. From the nasopharynx, organisms may reach the bloodstream, producing bacteremia. The disease usually begins with high fever , chills , vomiting and severe - headache progressing ^{to delirium and} convulsions . هزيان

Fulminant - meningococemia is more severe with high - fever and hemorrhagic - purpura , disseminated intravascular - coagulation (D . I . C) , with mucosal, subcutaneous and Gastrointestinal - bleedings , adrenal - Necrosis , adrenal - cortical - insufficiency , circulatory - collapse , shock & death .

Water house - Friderichsen - Syndrome , this is the most - severe form , and life - threatening form of meningococemia .

Water house - Friderichsen-syndrome is a term applied to a state of circulatory - collapse, high fever and extensive hemorrhages (Purpura) which result from Dic , and adrenal - cortical insufficiency. Dic leads to decreased platelets survival , due to increased platelets consumptions, thrombocytopenic-purpura and fatal - bleedings .

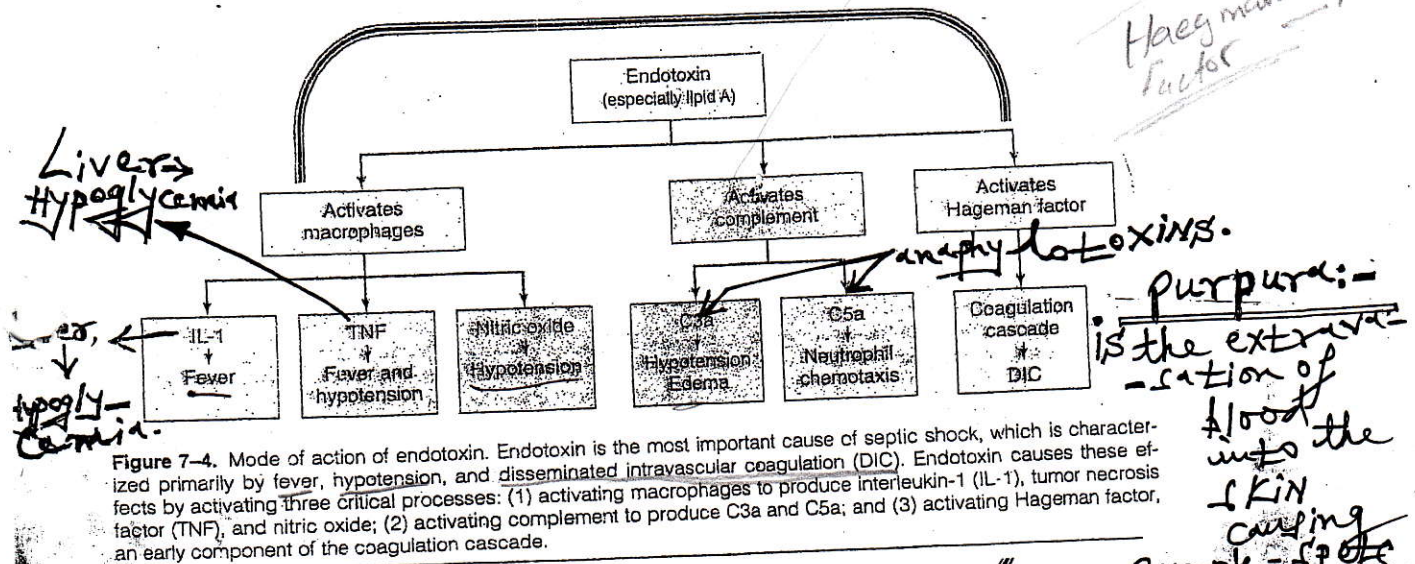
MENINGOCOCCEMIA AND SEPTICEMIA IS FAVORED BY:-

1. Absence of bactericidal antibody IgG.
2. Blocking IgA antibodies, blocking bactericidal activity of IgG and IgM antibodies (paradox effect).
3. Complement deficiencies of late acting complement components (C6 - C9).

Fever
Chills
Vomiting
Severe Headache
Delirium
Convulsions
DIC
Haemorrhagic purpura
Thrombocytopenia
Purpura
intestinal and
mucosal
Bleeding

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The Action of endotoxin of *Neisseria* Question



The biologic Effects Of Endotoxin Include:-

- (1) Fever due to the release by macrophages of endogenous pyrogen (interleukin-1), which acts on the hypothalamic temperature-regulatory center.
- (2) Hypotension, shock, and impaired perfusion of essential organs owing to induced vasodilation, increased vascular permeability, and decreased peripheral resistance (nitric oxide, a potent vasodilator, also causes hypotension).
- (3) Disseminated intravascular coagulation (DIC) due to activation of the coagulation system through Hageman factor (factor XII), resulting in thrombosis, a petechial or purpuric rash and tissue ischemia and necrosis and extensive bleedings leading to death.
- (4) Activation of the alternative pathway of the complement cascade, resulting in inflammation and tissue damage.

During meningococcemia, there is thrombosis of many blood vessels in many organs with perivascular infiltration and petechial - hemorrhages (widespread hemorrhagic - purpura).

There may be myocarditis and arthritis.

1 mp

Table 7-11. Beneficial and harmful effects of TNF.

Beneficial effects of small amounts of TNF - Inflammation, eg vasodilation, increased vascular permeability - Adhesion of neutrophils to endothelium - Enhanced microbicidal activity of neutrophils - Activation and adhesion of platelets - Increased expression of class I and II MHC proteins	inflammation vasodilation increased vascular permeability Adhesion of Neutrophil to endothelium enhanced microbicidal activity of Neutrophils Activation and adhesion of Platelets increased expression of class I and II MHC proteins
Harmful effects of large amounts of TNF - Septic shock, eg hypotension and high fever - Disseminated intravascular coagulation - Inflammatory symptoms of some autoimmune diseases	Septic shock and Hypotension and High fever DIC

Meningitis is the most common complication of meningococemia, seeding of the meningococci to many organs especially the meninges. It usually begins suddenly, with intense headache, vomiting, ^{delirium} convulsions and stiffneck, and progresses to coma (ischaemic damage) within a few hours, terminating fatally.

The ~~meninges~~ are acutely inflamed, with thrombosis of blood – vessels and exudation of polymorph nuclear leukocytes, so that the surface of the brain is covered with a thick purulent – exudate, and increased level of PMNS in spinal – fluid.

In meningitis exudates may involve the intracranial portion of the optic nerve, with subsequent neuritis and possible blindness.

Involvement of the facial and auditory nerves in a like manner may result in facial palsies and permanent deafness.

The prognosis of meningococcal – meningitis is much more worse in fulminant – septicemia with shock and extensive – hemorrhages.

COMPLICATIONS :-

1) Waterhouse – Friderichsen – syndrome: - circulatory – collapse, shock – and death.

2) DIC: → ischemic AND Necrotic – tissue – damages

→ Extensive bleedings

3) Brain – Lesions

4) Eye – lesions.

5) Myocarditis.

6) Ear – lesions.

7) Nephritis.

8) Arthritis.

10

Table 7-8. Effects of endotoxin.

Effect	Mediator
Fever	Interleukin-1
Hypotension (shock)	Bradykinin, Nitric oxide
Inflammation	Alternative pathway of complement (C3a, C5a)
Coagulation (DIC)	Activation of Hageman factor

¹ Tumor necrosis factor triggers many of these reactions.
² DIC, disseminated intravascular coagulation.

MENINGITIS



Coma, a sign of Cerebrospinal MENINGITIS.

Purpura, a condition characterized by hemorrhage into the skin. Is a sign of "FULMINANT-MENINGOCOCCEMIA".

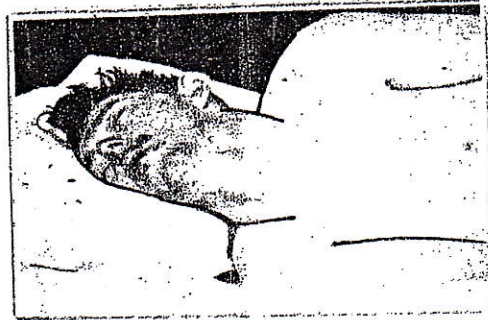
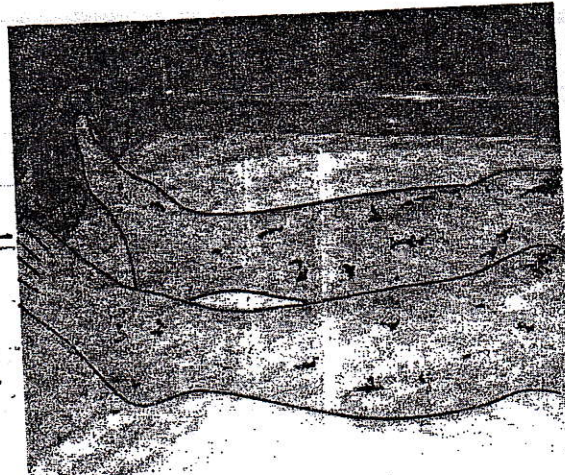


Fig. 10.85 Head retraction. Case of cerebrospinal meningitis. Note also the herpes labialis.

ONE OF THE ESSENTIAL-Signs of MENINGEAL-IRRITATION.



Brudzinski's neck sign

ONE OF THE ESSENTIAL-Signs of MENINGEAL-IRRITATION in MENINGITIS.

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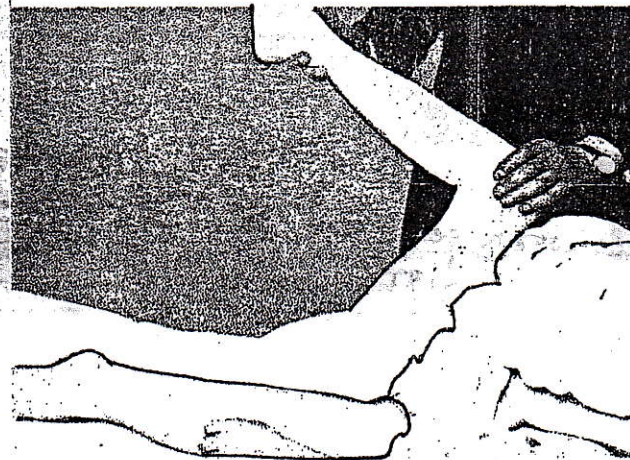
Kernig's Sign

a.



Fig. 10.86 Kernig's sign. a, Negative response. The leg can be well extended.

b.



b, Positive response. The leg cannot be extended to more than a right-angle when the thigh is well flexed on the abdomen. From a case of meningococcal meningitis.

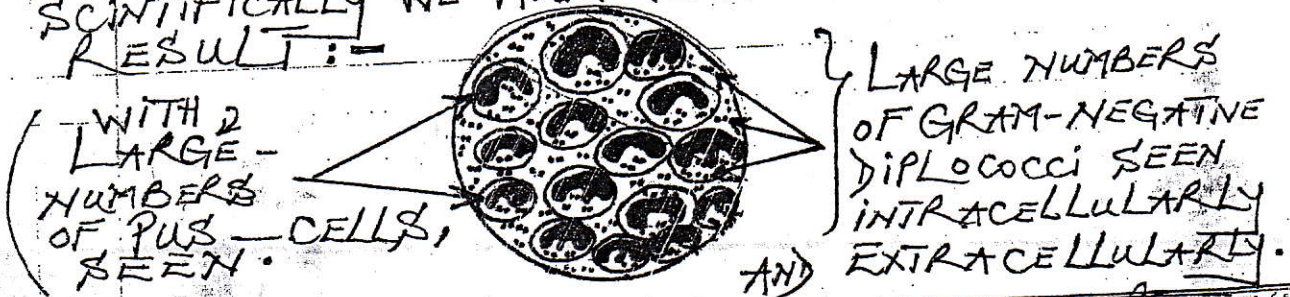
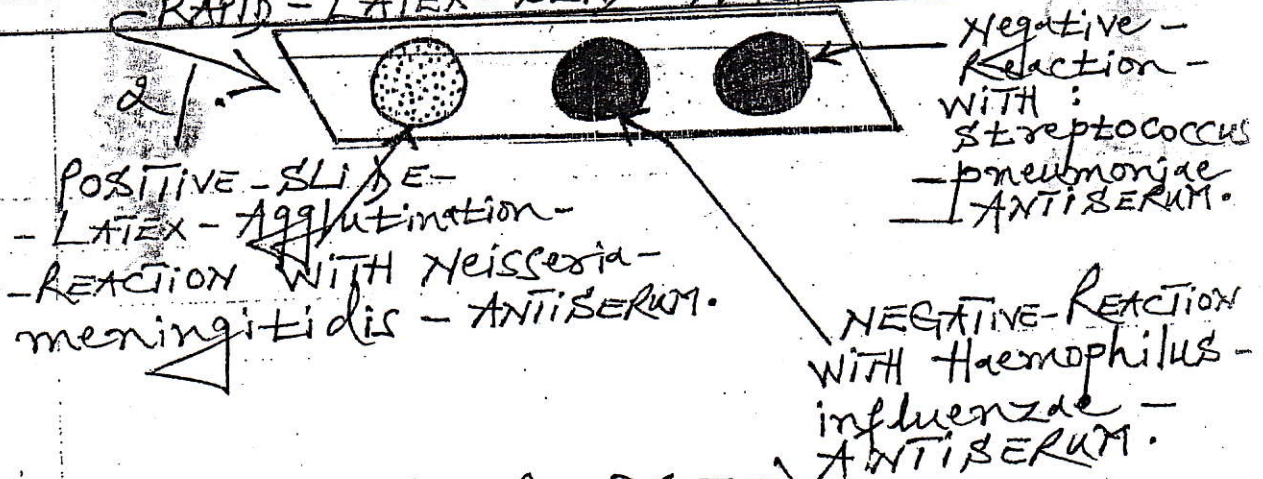
ONE OF THE ESSENTIAL -
SIGNS OF MENINGEAL-IRRITATION
IN " MENINGITIS .

LABORATORY - DIAGNOSIS :-

A. SPECIMENS: 1. CSF FOR CULTURE.
2. BLOOD FOR CULTURE.

B. METHODS: 1. URGENT GRAM-STAIN FOR CENTRIFUGED CSF - DEPOSIT ONLY.
AND 2. RAPID - LATEX - SLIDE - AGGLUTINATION - REACTION.

∴ 1. GRAM-STAINED - MICROSCOPICAL - PICTURE OF THE CSF - DEPOSIT REFLECTING AN ACUTE - MENINGOCOCCAL - MENINGITIS INFECTION. BUT SCIENTIFICALLY WE MUST WRITE THE FOLLOWING - RESULT :-

RAPID - LATEX - SLIDE - AGGLUTINATION - REACTION :-1+2 : CULTURE - METHOD :-

CULTURE OF CSF AND BLOOD.

CSF - CULTURE :-

CSF IS INOCULATED INTO CHOCOLATE - AGAR AND MacConkey - AGAR PLUS INTO BLOOD - AGAR AND MacConkey - AGAR → INTO THE INCUBATOR + 37°C Aerobically.

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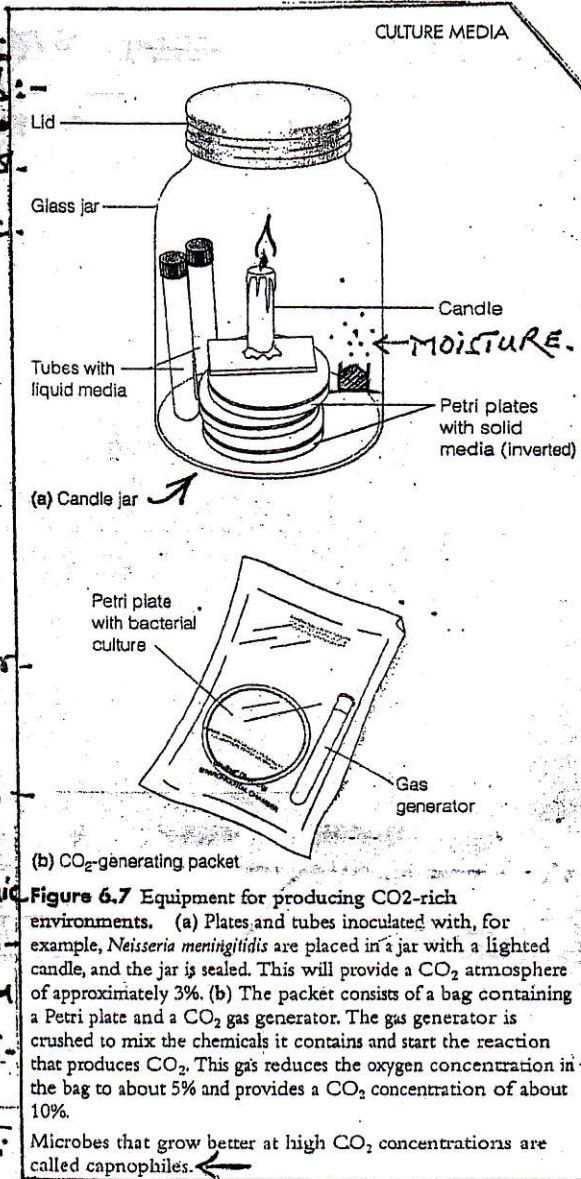
essential factors of growth
of *N. meningitidis*
N. gonorrhoeae

for *Neisseria*
growth

GROWTH

CHARACTERISTICS:-

- 1/ STRICT-AEROBES-
- 2/ GROW AT +35°C.
- 3/ GROW IN THE PRESENCE OF 5-10% CO₂.
- 4/ GROW IN THE PRESENCE OF MOISTURE.
- 5/ INTRACELLULAR growth.
- 6/ GROW ONLY IN ENRICHED MEDIA.
- 7/ ALL Pathogenic AND NON-Pathogenic-*Neisseria* ARE OXIDASE POSITIVE.
- 8/ OXIDASE-TEST:



NOTE:-

THAYER-MARTIN-MEDIUM (CHOCO-LATE AGAR + VCN (Vancomycin + Colistin + Nystatin) IS USED ONLY FOR CULTURE OF NASOPHARYNGEAL-SWABS FROM CARRIERS IN KINDERGARTENS, SCHOOLS, ARMY, CONTACTS, ETC.

CHOCOLATE-agar-plate
colonies of *Neisseria meningitidis*

oxidase-paper turns purple-colour.

14

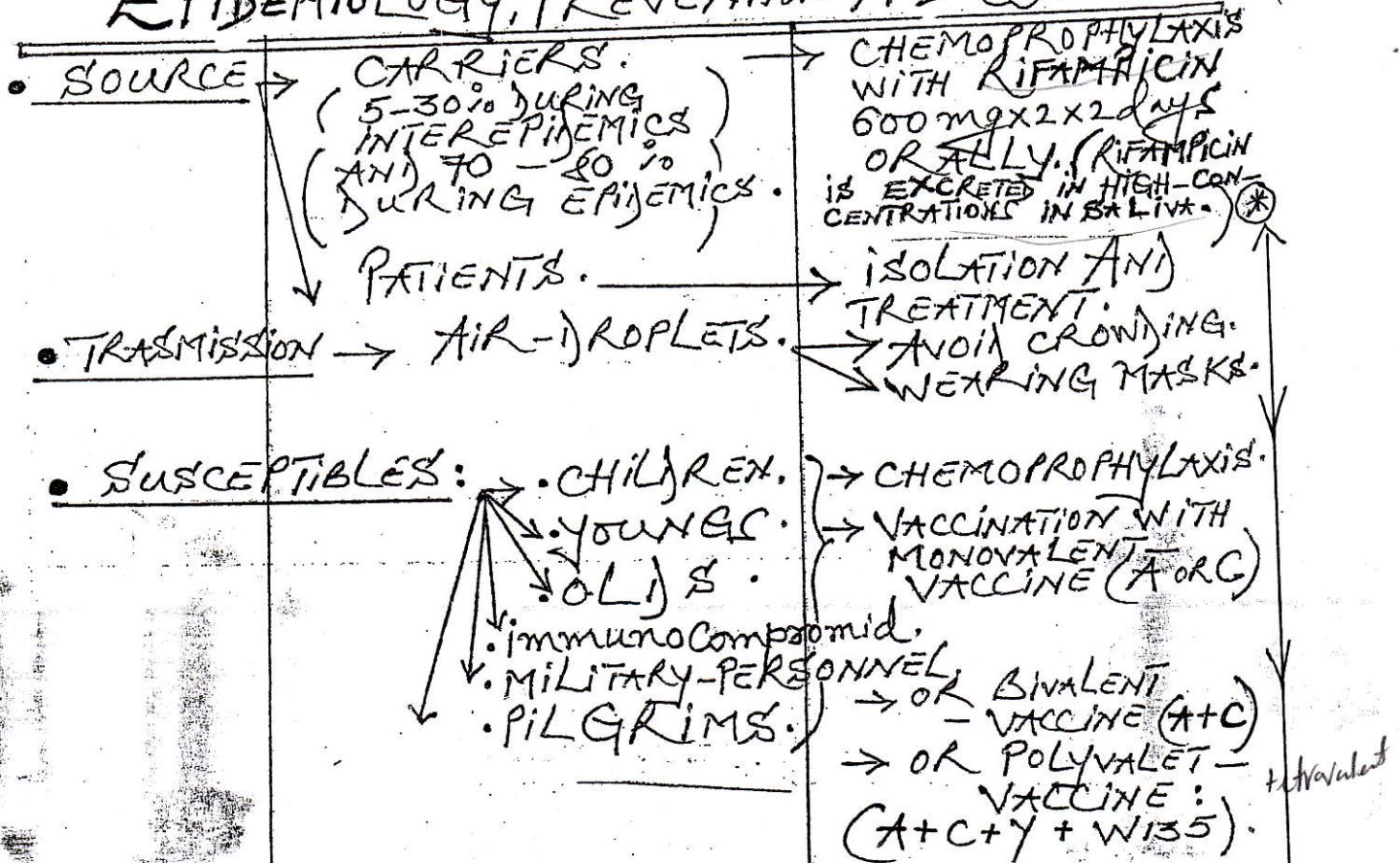
Gram-stain + 10% Sensitivity-testing on CHOCOLATE-agar, because of XMDSP.

Naso pharyngeal swab for carriers only.

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Treatment Penicillin G is the treatment of choice for meningococcal infections. Strains resistant to penicillin have emerged, but sulfonamide resistance is common. (See annex)* - N.m.D.S.P. (SEROGROUP: W135).

EPIDEMIOLOGY, PREVENTION AND CONTROL:



* **NEISSERIA MENINGITIDIS WITH DECREASED SUSCEPTIBILITY TO PENICILLIN IN ONTARIO, CANADA 1997-2000 / SEROGROUP - W135.**

ANNEX. ↑
(N.m.D.S.P.)

NOTE: -

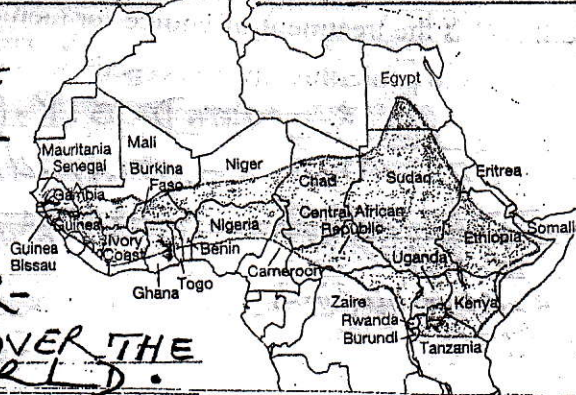
The vaccine does not contain the group B polysaccharide, which is poorly immunogenic in humans. As well as it is not recommended for children under the age of 2 years, because children under 2 years of age do not reliably produce antibodies when immunized with bacterial polysaccharide - vaccine such as the Polyvalent-A, C, Y, W135-Vaccine.

* IN CONTRAST TO PENICILLINS, THEREFORE IT IS SUCCESSFULLY-USED IN THE PROPHYLAXIS OF MENINGOCOCCAL AND OTHER BACTERIAL-MENINGITIS.

THE MENINGITIS BELT:

EPIDEMICS OF
MENINGOCOCCAL
MENINGITIS

OCCUR - ROUGHLY
IN 5-TO-12 YEAR-
CYCLES ALL OVER THE
WORLD.



HOW CAN THE SEASONALITY OF MENINGITIS OUTBREAKS BE EXPLAINED ?

1. ENVIRONMENTAL FACTORS :-

- a. Humidity.
 - b. Heat.
- Cause nasal and throat membranes to dry out, this will make the meningococci enter the blood stream.

2. OTHER DISEASES :-

- a. Dry seasons of more colds, mycoplasma, influenza and U.R.T. infections, this encourages meningococcal diseases 23 times to occur.

3. HERD IMMUNITY :-

- a. During epidemics most people acquire antibodies against that circulatory strain.
- b. Newborns are more susceptible.

4. STRAIN VIRULENCE :-

During the years between epidemics (cycles of 5 to 12 years), new mutants (strains) will arise, which are more virulent, and can initiate a new epidemic.

5. TIMING :-

- a. Dry season: meningitis will occur.
- b. Rainy season : people will become carriers and will develop antibodies.

save must.

VACCINATION - SCHEDULE :- (IMMUNIZATION - SCHEDULE).

1. AT BIRTH:	→ B. C. G - VACCINE. → Hib - VACCINE.
2. 2-MONTHS OF AGE:	→ ORAL-POLIO-VACCINE. → D. P. T - VACCINE. → Hib - VACCINE. → H.B. - VACCINE.
3. 4-MONTHS OF AGE:	→ ORAL-POLIO-VACCINE. → D. P. T. → Hib - VACCINE.
4. 6-MONTHS OF AGE:	→ ORAL-POLIO-VACCINE. → D. P. T - VACCINE. → Hib - VACCINE. → H.B. - VACCINE.
5. ONE-YEAR OF AGE:	→ H.B. - VACCINE. → M. M. R - VACCINE. (MEASLES - MUMPS - RUBELLA).
6. 18-MONTHS-AGE:	→ ORAL-POLIO-VACCINE. → D. P. T - VACCINE. → Hib - VACCINE.
7. 4 years - 6 years:	→ ORAL-POLIO-VACCINE. → D. P. T - VACCINE. → M. M. R - VACCINE.

17

END

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